SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15995J

COMMISSIONING

02/05

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SECTION 15995J

COMMISSIONING
02/05

****
NOTE: This guide specification covers the requirements for commissioning of HVAC systems.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.
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PART 1 GENERAL

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NOTE: Use of this specification is mandatory for all projects. A properly functioning HVAC system assures a comfortable, healthy and productive environment for the user. The "Design Agent's Representative" will be a member of the HVAC design team, i.e. from the AE or Engineering Division. The "Design Agent's Representative" will actively participate in the process, including review of all submittals contained herein.
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1.1 SUBMITTALS

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NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

Indicate submittal classification in the blank space following the name of the item requiring the submittal by using "G" when the submittal requires Contractor approval. Submittals not classified as "G" will show on the submittal register as "Information Only". For submittals requiring Contractor approval, a code of up to three characters should be used following the "G" designation to indicate the approving authority; codes of "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval are recommended.
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The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-03 Product Data

Commissioning Team

List of team members who will represent the Subcontractor in the pre-commissioning checks and functional performance testing, at least 2 weeks prior to the start of pre-commissioning checks. Proposed revision to the list, prior to the start of the impacted work.

Test Procedures

Detailed procedures for pre-commissioning checks and functional performance tests, at least 4 weeks prior to the start of pre-commissioning checks.

Test Schedule

Schedule for pre-commissioning checks and functional performance tests, at least 2 weeks prior to the start of pre-commissioning checks.

SD-06 Test Reports

Test Reports

Completed pre-commissioning checklists and functional performance test checklists organized by facility system and by electrical and mechanical subsystems and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

1.2 SEQUENCING AND SCHEDULING

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NOTE: Provide seismic requirements, if a Contractor designer (either Corps office of A/E) is the Engineer of Record, and show on the drawings. Delete the bracketed phrase if seismic details are not included. Sections 13080 and 15070, properly edited, must be included in the Subcontract documents.

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The work described in this Section shall begin only after all work required in related sections has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved, including but not limited to pre-commissoning Test Schedule and all applicable Test Reports.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 COMMISSIONING TEAM AND CHECKLISTS

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NOTE: The "Design Agent's Representative" will be included as a member of the commissioning team for the pre-commissioning checklists and will participate in the functional performance tests.

The checklists provided are to be used as guides for the preparation of project checklists. The appropriate checklist should be included in the project specification for each HVAC equipment component. The designer will add additional checklists for equipment or systems not included in this guide specification or modify the checklists where necessary for specific project requirements. If, for example, a system needs to be tested with certain internal load, each appropriate checklist should be modified to include this requirement along with specifics on how load should be generated.

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The Subcontractor shall designate team members to participate in the pre-commissioning checks and the functional performance testing specified herein. In addition, the Air Force will be represented as will, the Design Agent, and the Using Agency. The team members shall be as follows:

Designation	Function
Q	Subcontractor's Chief Quality Control Representative
M	Subcontractor's Mechanical Representative
E	Subcontractor's Electrical Representative
C	Subcontractor's Controls Representative
D	Design Engineering Agent's Representative
S	Subcontract Administrator's Representative
A	Air Force's Representative

Each checklist shown in appendices A and B shall be completed by the commissioning team. Acceptance by each commissioning team member of each pre-commissioning checklist item shall be indicated by initials and date unless an "X" is shown indicating that participation by that individual is not required. Acceptance by each commissioning team member of each functional performance test checklist shall be indicated by signature and date.

3.2 TESTS

The pre-commissioning checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide the information required. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used

to satisfy any of the requirements specified in this Section. The Subcontractor shall provide all materials, services, and labor required to perform the pre-commissioning checks and functional performance tests. A pre-commissioning check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating non-Air Force commissioning team member of which participation is specified is not present for the test. The Subcontractor shall reimburse the Contractor for all costs associated with effort lost due to tests that are aborted. These costs shall include salary, travel costs and per diem (where applicable) for Air Force commissioning team members.

3.2.1 Commissioning Procedures

The Subcontractor shall develop and submit for approval commissioning procedures for both pre-commissioning checks and for functional performance tests. See Appendix A and B for sample formats.

3.2.2 Pre-Commissioning Checks

Pre-commissioning checks shall be performed for the items indicated on the checklists in Appendix A. Deficiencies discovered during these checks shall be corrected and retested in accordance with the applicable Subcontract requirements.

3.2.3 Functional Performance Tests

Functional performance tests shall be performed for the items indicated on the checklists in Appendix B. Functional performance tests shall begin only after all pre-commissioning checks have been successfully completed. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant Subcontract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Subcontractor shall correct all deficiencies in accordance with the applicable subcontract requirements. The checklist shall then be repeated until it has been completed with no errors.

APPENDIX A

PRE-COMMISSIONING CHECKLISTS

PRE-COMMISSIONING CHECKLIST

FOR ACCC-3 (AIR COOLED CONDENSING COIL 3)

CHECKLIST APPROVAL	**Q**	**M**	**E**	**C**	**D**	**S**	**A***
INSTALLATION							
a. Permanent engraved label with device name and circuit identification	___	___	___	___	___	___	___
b. NEMA 4 Safety Switch installed	___	___	___	___	___	___	___
c. Proper power voltage verified	___	___	___	___	___	___	___
d. Adequate power wire size	___	___	___	___	___	___	___
e. Insulating bushings installed	___	___	___	___	___	___	___
f. Proper grounding to the backplate	___	___	___	___	___	___	___
g. Frame anchored to the mounting pad	___	___	___	___	___	___	___
h. Clearance for air flow and maintenance provided	___	___	___	___	___	___	___
i. Piping installed per manufacturer's instruction, including traps	___	___	___	___	___	___	___
j. Etc, additional steps as required for the device	___	___	___	___	___	___	___

Accepted By: _____ Date: _____
SGS Subcontractor Administrator Representative

*** OPTIONAL**

PRE-COMMISSIONING CHECKLIST

FOR AHU-3 (AIR HANDLING UNIT 3)

CHECKLIST APPROVAL	**Q**	**M**	**E**	**C**	**D**	**S**	**A***
INSTALLATION							
a. AHU-3 installed on a housekeeping pad	___	___	___	___	___	___	___
b. AHU-3 located to allow clearance for door openings & maintenance	___	___	___	___	___	___	___
c. Unit anchored to pad	___	___	___	___	___	___	___
d. Filter unit installed & sealed	___	___	___	___	___	___	___
e. Flex installed between the AHU and the supply air ductwork	___	___	___	___	___	___	___
f. Flex installed between the AHU and the return air ductwork	___	___	___	___	___	___	___
g. Refrigerant piping between AHU and air cooled condensing coil installed per manufacturer's instruction	___	___	___	___	___	___	___
h. Isolation valves installed in refrigeration piping between AHU and air cooled condensing coil	___	___	___	___	___	___	___
i. Resilient hangers installed on refrigeration piping	___	___	___	___	___	___	___
j. Potable water shut-off valve installed	___	___	___	___	___	___	___
k. Potable water connected to humidifier per manufacturer's instructions	___	___	___	___	___	___	___
l. Hard copper condensate drain, with trap & insulation, installed to floor drain	___	___	___	___	___	___	___
m. Condensate drain slope to floor drain verified	___	___	___	___	___	___	___
n. Permanent engraved label with device name and circuit identification	___	___	___	___	___	___	___
o. Proper power voltage verified	___	___	___	___	___	___	___
p. Adequate power wire size	___	___	___	___	___	___	___
q. Insulating bushings installed	___	___	___	___	___	___	___
r. Proper grounding to the backplate	___	___	___	___	___	___	___

PRE-COMMISSIONING CHECKLIST

FOR AHU-3 (AIR HANDLING UNIT 3)

CHECKLIST APPROVAL	**Q**	**M**	**E**	**C**	**D**	**S**	**A***
INSTALLATION							
s. Fan rotation correct	___	___	___	___	___	___	___
t. Filters installed	___	___	___	___	___	___	___
u. Control interface wiring pulled and terminated	___	___	___	___	___	___	___
v. All conductors labeled per control drawings	___	___	___	___	___	___	___
w. Supply ductwork installed	___	___	___	___	___	___	___
x. Back-draft dampers installed in each the two supply air ducts	___	___	___	___	___	___	___
y. Supply ductwork insulated	___	___	___	___	___	___	___
z. Etc, additional steps as required for the device	___	___	___	___	___	___	___

Accepted By: _____ Date: _____
SGS Subcontractor Administrator Representative

*** OPTIONAL**

APPENDIX B

FUNCTIONAL PERFORMANCE TESTS CHECKLISTS

FUNCTIONAL PERFORMANCE TEST CHECKLIST

FOR ACCC-3 (AIR COOLED CONDENSING COIL 3)

CHECKLIST APPROVAL	**Q**	**M**	**E**	**C**	**D**	**S**	**A***
FUNCTIONAL PERFORMANCE TESTING							
a. AHU-3 system energized & operating	___	___	___	___	___	___	___
b. Power to ACCC-3 energized	___	___	___	___	___	___	___
c. Fan operates to maintain pressure in the 1st circuit	___	___	___	___	___	___	___
d. Fan operates to maintain pressure in the 2nd circuit	___	___	___	___	___	___	___
e. Low ambient controls test	___	___	___	___	___	___	___
f. Etc, additional steps as required for the device	___	___	___	___	___	___	___

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FUNCTIONAL PERFORMANCE TEST CHECKLIST

FOR AHU-3 (ENVIRONMENTAL CONTROL UNIT)

CHECKLIST APPROVAL	**Q**	**M**	**E**	**C**	**D**	**R**	**A***
FUNCTIONAL PERFORMANCE TESTING							
a. Verify AHU fan starts when the control system is activated	___	___	___	___	___	___	___
b. Lower the room temperature set point. Verify that the lead compressor is activated.	___	___	___	___	___	___	___
c. Further lower the room temperature set point. Verify that the lag compressor is activated.	___	___	___	___	___	___	___
d. Raise the room temperature set point. Verify that the lag compressor is de-activated.	___	___	___	___	___	___	___
e. Further raise the room temperature set point. Verify that the lead compressor is de-activated.	___	___	___	___	___	___	___
f. Adjust the room temperature set point to 72 deg F	___	___	___	___	___	___	___
g. Lower the room RH set point. Verify that the lead compressor is activated.	___	___	___	___	___	___	___
h. Further lower the room RH set point. Verify that the lag compressor is activated, with time delay	___	___	___	___	___	___	___
i. Verify that the 1st stage reheat coil is active when the room temperature falls below set point	___	___	___	___	___	___	___
j. Verify that the 2nd stage reheat coil is active when the room temperature continues to fall below set point	___	___	___	___	___	___	___
k. Reverse the actions of g) and h). Verify the reverse responses of I) and j)	___	___	___	___	___	___	___
l. Raise the room RH set point. Verify that the humidifier is activated.	___	___	___	___	___	___	___
m. Further raise the room RH set point. Verify that the humidifier output increases	___	___	___	___	___	___	___

FUNCTIONAL PERFORMANCE TEST CHECKLIST

FOR AHU-3 (ENVIRONMENTAL CONTROL UNIT)

CHECKLIST APPROVAL	**Q**	**M**	**E**	**C**	**D**	**R**	**A***
FUNCTIONAL PERFORMANCE TESTING							
n. Lower the room RH set point. Verify that the humidifier is de-activated.	___	___	___	___	___	___	___
o. Adjust the room RH set point to 40%	___	___	___	___	___	___	___
p. Adjust the room temperature set point such that a high temperature out of tolerance condition is created. Verify that the out of tolerance condition is communicated to the _____ through the Autochangeover controller.	___	___	___	___	___	___	___
q. Adjust the room temperature set point such that a low temperature out of tolerance condition is created. Verify that the out of tolerance condition is communicated to the _____ through the Autochangeover controller.	___	___	___	___	___	___	___
r. Adjust the room RH set point such that a high RH out of tolerance condition is created. Verify that the out of tolerance condition is communicated to the _____ through the Autochangeover controller.	___	___	___	___	___	___	___
t. Adjust the room RH set point such that a low RH out of tolerance condition is created. Verify that the out of tolerance condition is communicated to the _____ through the Autochangeover controller.	___	___	___	___	___	___	___

Accepted By: _____ Date: _____
SGS Subcontractor Administrator Representative

*** OPTIONAL**

-- End of Section --